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ONTARIO ARCHAEOLOGICAL SOCIETY
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LONDON CHAPTER OAS

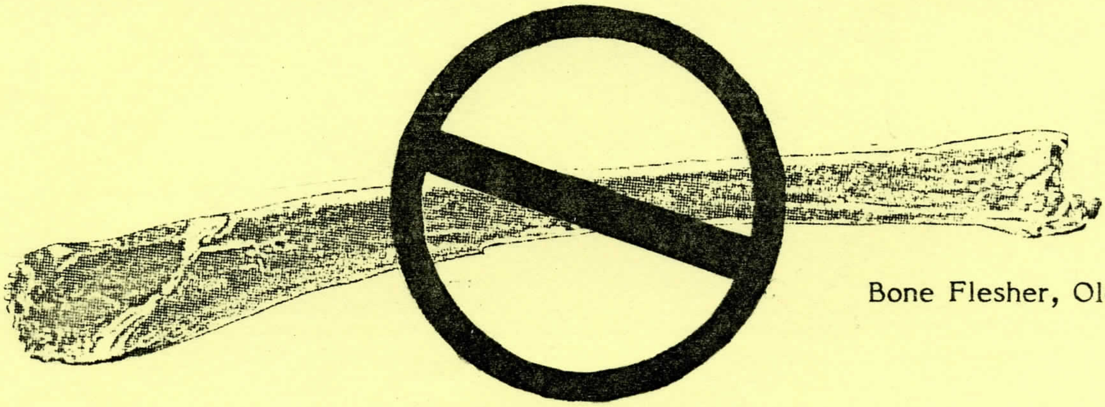
January, 1989

89-1

An Overview of Possible Pre-Clovis Sites in North America

Dr. Christopher Ellis, University of Waterloo

Was there life before fluted points? Did man travel to North America in an earlier ice age? Despite substantial work to prove an early presence for man in North America, data remains tenuous at best. Hard evidence of a Human occupation prior to 13,000 - 15,000 years ago eludes archaeologists, despite a very real desire on the part of some to see the span of man's presence in North America extending back some 50,000 to 70,000 years. Chris Ellis will guide us through some of the famous sites used to argue for pre-Clovis occupations, reviewing the findings and weighing their credibility. This promises to be an exciting and entertaining presentation, so be sure to attend. Meeting time is 8 PM, Thursday February 9th, at the Museum of Indian Archaeology.



Bone Flesher, Old Crow Flats

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EXECUTIVE REPORT

The 1989 Chapter Executive have met once already this year, and with only one change in personnel, there was not much need for going over old business. Currently the Executive is trying to prepare for hosting this fall's OAS symposium by working out a rough schedule of organizational activities. All preliminary matters have been handled so there is not much required for the next few months, until the various sessions are more formally set. We are, however, looking now for volunteers who can serve on a Local Arrangements Committee. If interested please contact the Executive.

A recent large order of **Studies in Southwestern Ontario Archaeology** has dwindled existing stock to a few meagre copies. This volume is now officially out of print, however a few copies are still available to London Chapter members. If you have been putting off obtaining one, now is the time to do so, before we are completely sold out. Many copies still exist of O. P. #2 **Archaeological Consulting in Ontario**, and are now being sold for $6.00 a copy. Take advantage of this discount to add to your collection of London Chapter publications. O. P. #5, **The Archaeology of Southern Ontario to A.D. 1650**, is still moving slowly along. However, it is the Executive's hope that both it and O. P. #6 **Boreal Forest and Sub-Arctic Archaeology** will be available for purchase at the October OAS symposium.

A reminder, this is the last month for submitting ideas to the Chapter's **Design a Cover for the Southern Ontario Prehistory Volume Contest.** You can submit either a finished drawing, a sketch or a written description of your idea in order to be considered, but hurry before the contest closes.

**** DON'T FORGET 1989 CHAPTER MEMBERSHIP FEES ARE NOW DUE ****

SOCIAL REPORT

This March 9th, at the Museum of Indian Archaeology, will be the London Chapter's annual **Member's Speaker Night.** Two speakers are still needed to fill the agenda. Anyone interested in giving a presentation on some research they have been doing; an interesting place they've visited; or a funny talk are encouraged to notify the Chapter Executive in the next two weeks.

At Lab Nights we now have progressed through much of the material from the 1988 Van Bemmel excavations. So, for the remainder of the season, most participants will help sort, catalogue and analyse the artifact classes recovered. Due to the rather substantial, multi-component nature of the site, analyses in rim sherds, decorated ceramics, body sherds, projectile points, scrapers and other lithic tools, flake studies, artifact distribution maps, and even work on the 19th century component of the site is required. So, if you've been looking for an opportunity to broaden your artifact analysis skills come on out to Lab Nights, at 55 Centre Street (in the south end of town), every Thursday (except for speaker nights), between 7 and 9:30 P.M. Don't forget, Lab Nights are a **PASSPORTS TO THE PAST** activity - bring yours out to be stamped!

EDITOR'S NOTE

Our contribution this month comes from deep inside the bowels of Ian Kenyon's computer. Ian's discussion of Late Archaic point types provides an interesting review of the Small Point Tradition, and should make us all a little more nervous of superficial use and reliance on point "types". Maybe they should be referred to as point "sort-ofs"!

TERMINAL ARCHAIC PROJECTILE POINTS IN SOUTHWESTERN ONTARIO: AN EXPLORATORY STUDY

Ian Kenyon

Between the ca. 1800 B.C. Broadpoint Archaic sites of Ontario and the development of the distinctive Early Woodland Meadowood complex of ca. 700 to 400 B.C. is an approximately 1000 year time span that can be conveniently called the Terminal Archaic. A number of Terminal Archaic sites have been excavated in Southwestern Ontario (Figure 1 shows only some of these sites). Projectile points recovered from these Terminal Archaic sites range in size from very small to very large, and they may be either side notched, corner notched or expanding stemmed. This paper attempts to analyze the significance of this considerable range of size and morphological variation.

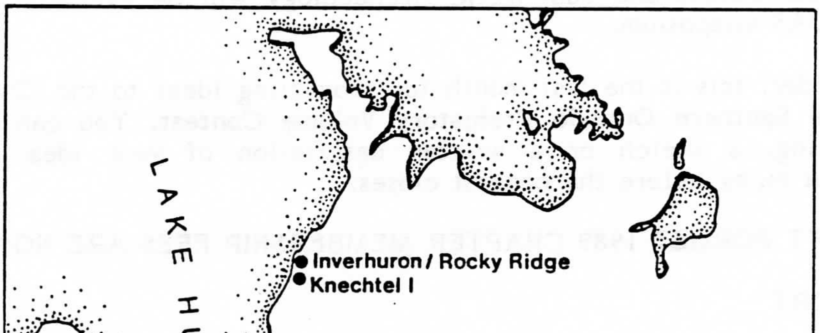


Figure 1. Location of Ontario Late Archaic Sites Discussed in Text.

Sites and Radiocarbon Dates

Samples of projectile points from seven sites are examined here (Figures 1 and 2). With the exception of the Hind cemetery, the sites are habitation components. All sites but Welke-Tonkonoh have been radiocarbon dated; however, dating Late Archaic sites seems to be a precarious business for, of the the 18 radiocarbon dates discussed below, 8 are considered by their investigators to be either too early or too late. (Note that all dates used in this paper are uncorrected for C14 variation and are calculated by subtracting 1950 from the B.P. date as given by the radiocarbon laboratory.)

Crawford Knoll. This site, located near the delta of the St. Clair River, was excavated in 1979 (Kenyon 1980a). There was no stratigraphy, but below the plough zone was a bone-filled midden and six pit features. Although the majority of the projectile points were found in the plough zone or on the surface, there are no "intrusive" specimens: all complete or near complete points are shown in Figure 2. Two samples of deer bone were submitted for AMS radiocarbon dating at the ISOTRACE facility (Ferris 1988). The two dates are widely divergent: one of 13170 ± 100 B.P. is clearly unacceptable; the second date of 1530 ± 120 B.C. is plausible.

Innes. The Innes site, near an interior swamp, was excavated in 1981 and 1982 as part of a highway salvage project (Lennox 1986). Although a few subsurface features were located, much of the artifact collection, and all of the points, derives from the plough zone, where patient screening revealed two artifact clusters, each about 15 by 10 m in size. In the collection of projectile points are two "aberrant" or "intrusive" specimens (Lennox 1986: Figure 10: 15 & 16); these are excluded from the present analysis. There are three discrepant dates from Innes: 1400 ± 195 B.C., 670 ± 80 B.C. and A.D. 1655 ± 125. While the last date is clearly unacceptable, the other two, taking into account the error measures, are both plausible for a Late Archaic site, although the earliest date is preferred by the site investigator.

Knechtel I. Located in a sand dune area near the Lake Huron shore in Bruce County, the Knechtel I site was excavated by James Wright (1972) in 1969 and 1970. Five stratigraphic Archaic levels were identified, although not all were continuous over the site. Knechtel I is the best radiocarbon dated Late Archaic site in southwestern Ontario with 6 readings, four of which are considered acceptable by the excavator: 1740 ± 45 B.C., 1300 ± 90 B.C., 1090 ± 40 B.C. and 938 ± 45 B.C.

Inverhuron. Not far north of Knechtel I is Inverhuron Provincial Park, where, too, Archaic deposits have been found in the sand dunes. Several Archaic sites were explored by Walter Kenyon in 1957 (W. Kenyon 1959), notably what he termed Areas "M" and "R", located about 1 km from each other. The majority of the Archaic points derived from Area R, with a single complete specimen from "M" (W. Kenyon 1959: Plate 4). A charcoal sample was submitted from Area M for radiocarbon dating; however, slightly different dates have been cited: according to W. Kenyon's (1959) report the date is 950 ± 75 B.C. while Wilmeth's (1978: 125) compilation of carbon dates gives it as 900 ± 60 B.C.

Rocky Ridge. In 1969 and 1970, Peter Ramsden (n.d.) excavated another Archaic component in Inverhuron Park, which he named the Rocky Ridge site and was located near Kenyon's Area R. Three Archaic cultural strata were found at the site; the lowest level is radiocarbon dated to 1150 ± 120 B.C. A second date of A.D. 250 ± 150 is rejected as being too recent.

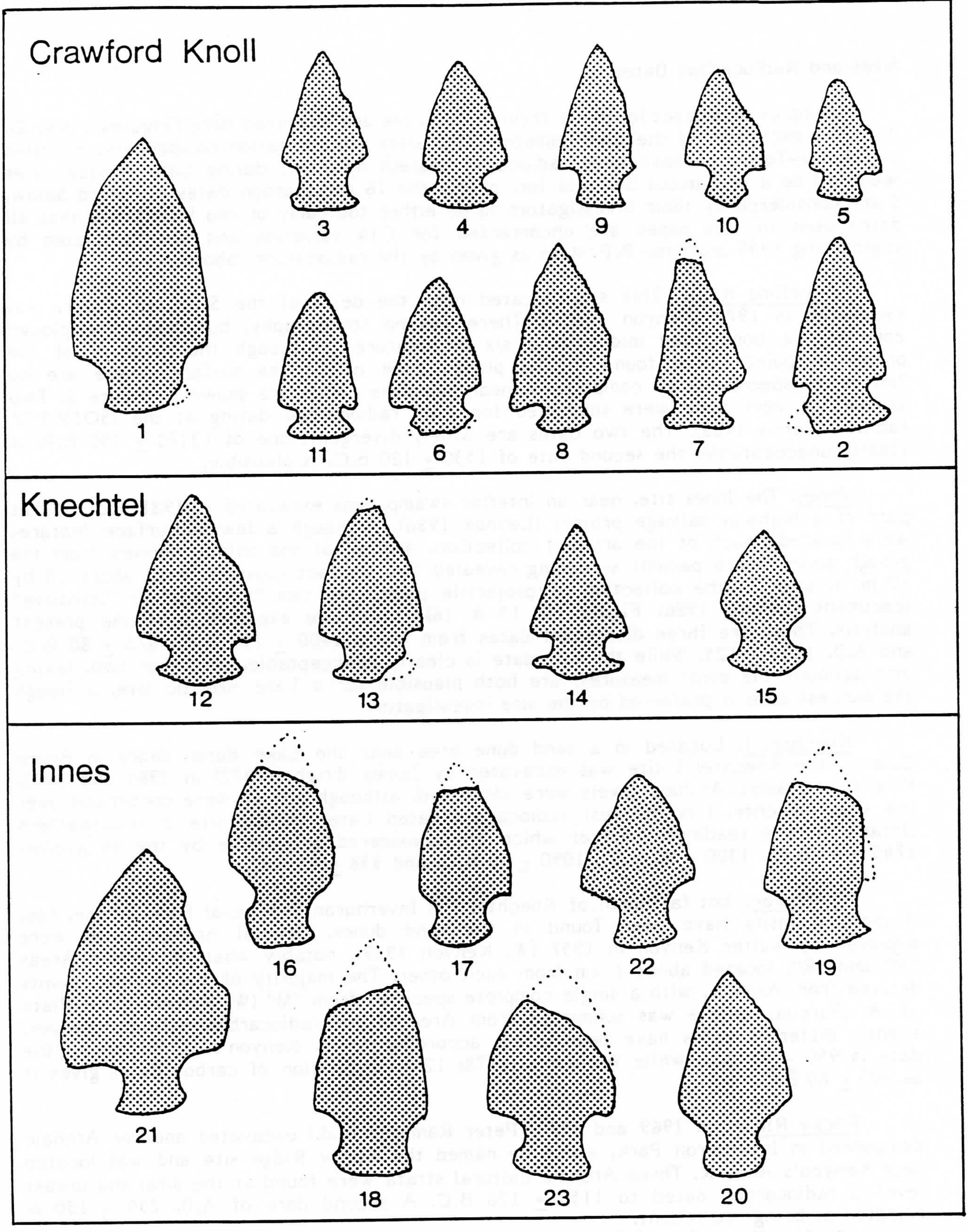


Figure 2a. Outline Drawings of Projectile Points from Crawford Knoll, Knechtel and Innes (actual size). Numbers as in Table 1.

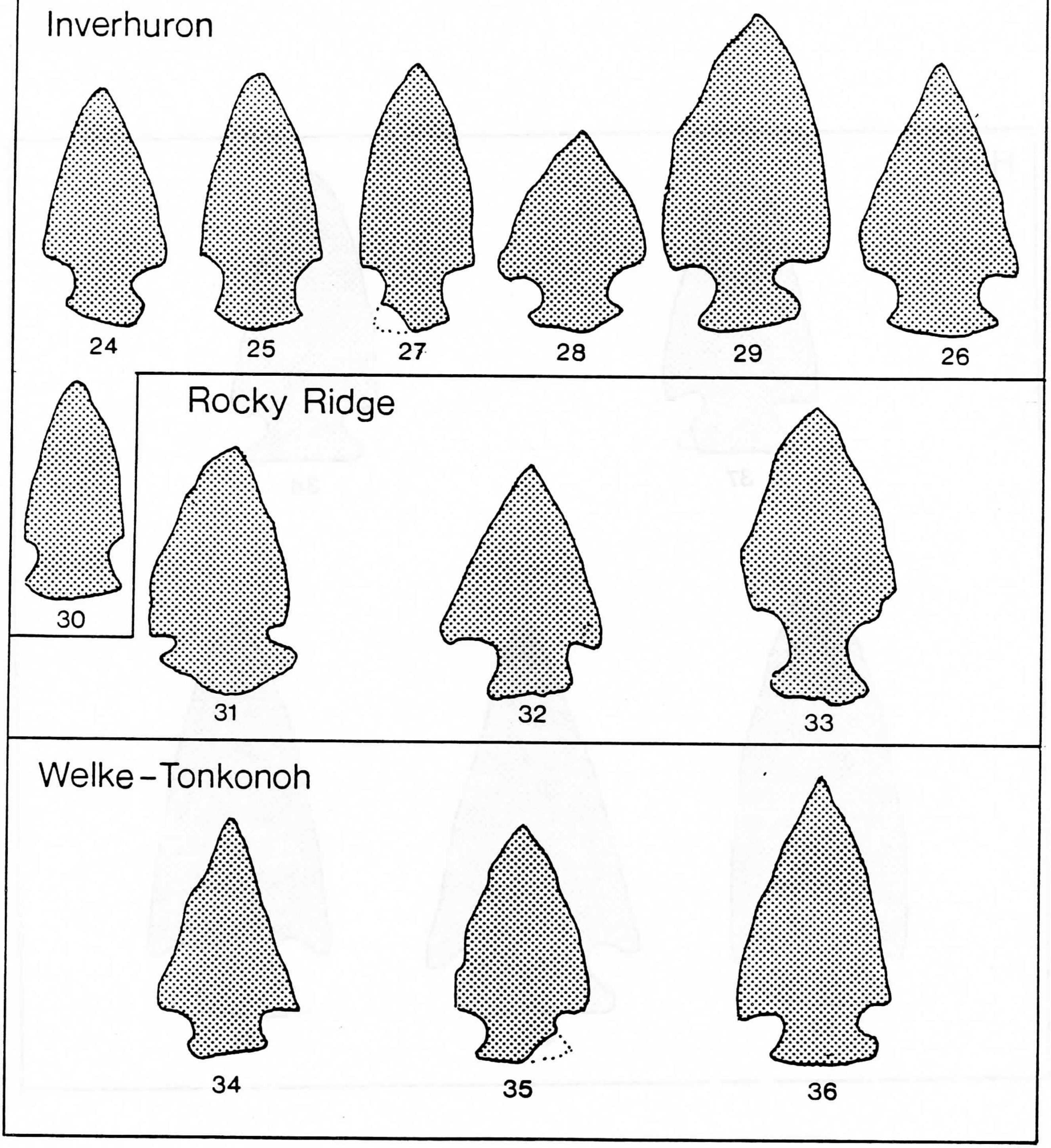


Figure 2b. Outline Drawings of Projectile Points from Inverhuron, Rocky Ridge and Welke-Tonkonoh (actual size).

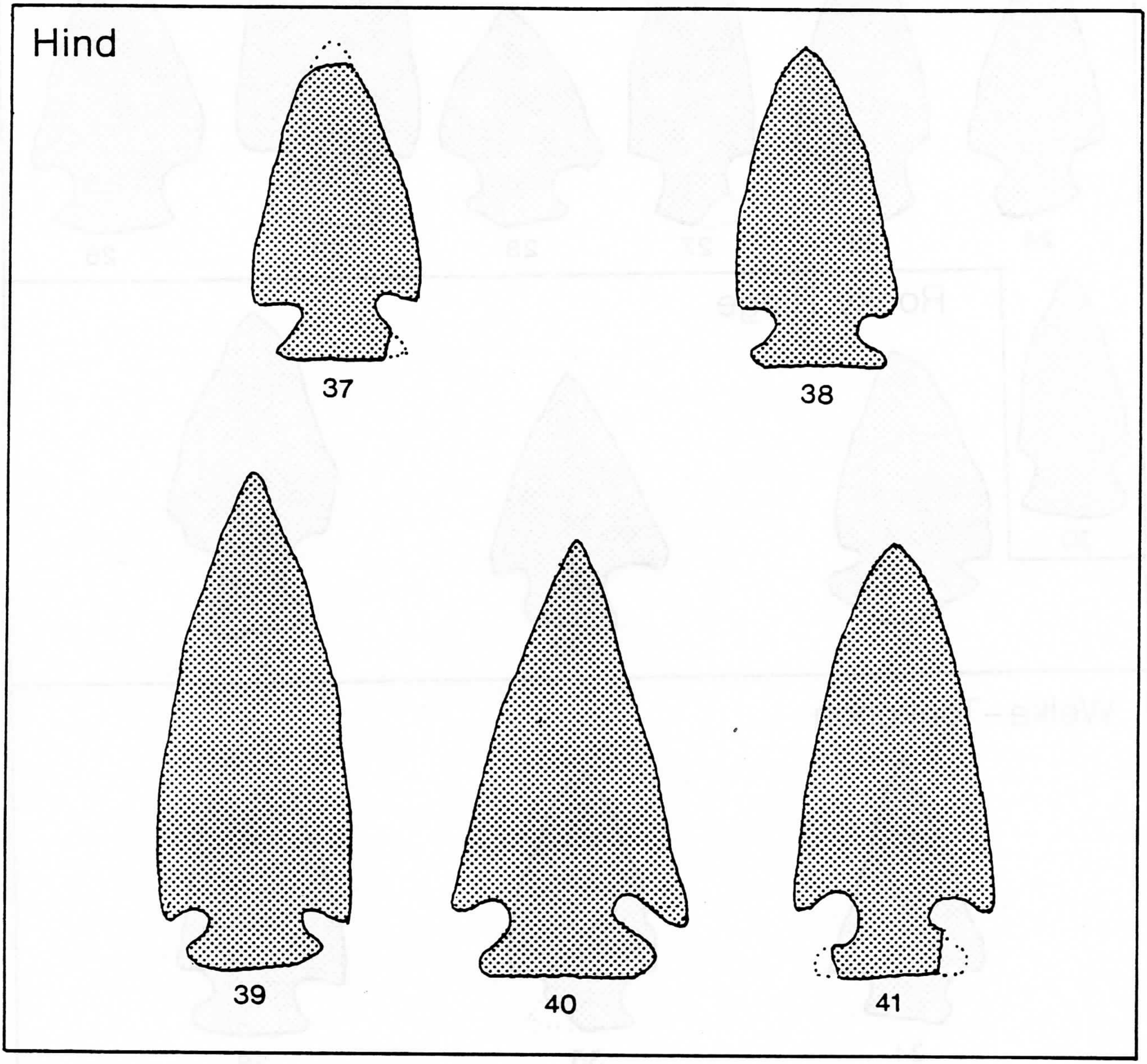


Figure 2c. Outline Drawings of Projectile Points from Hind Cemetery Site (actual size).

No.	Site	Len	ShW	StW	BaW	ShH	Reference	Figure
1	Crawford Knoll	51	26	13	15	12	I. Kenyon 1980a	2:6
2	Crawford Knoll	38	19	12	18	10	I. Kenyon 1980a	2:11
3	Crawford Knoll	30	17	10	13	9	I. Kenyon 1980a	2:1
4	Crawford Knoll	28	16	9	14	8	I. Kenyon 1980a	2:2
5	Crawford Knoll	24	14	8	9	5	I. Kenyon 1980a	2:5
6	Crawford Knoll	30	18	11	13	8	I. Kenyon 1980a	2:8
7	Crawford Knoll	37	18	10	13	8	I. Kenyon 1980a	2:10
8	Crawford Knoll	37	20	9	10	7	I. Kenyon 1980a	2:9
9	Crawford Knoll	31	15	9	9	7	I. Kenyon 1980a	2:3
10	Crawford Knoll	26	15	7	8	7	I. Kenyon 1980a	2:4
11	Crawford Knoll	28	15	9	12	6	I. Kenyon 1980a	2:7
12	Knechtel I	35	22	12	16	8	Wright 1972	6:1
13	Knechtel I	35	21	11	16	9	Wright 1972	5:1
14	Knechtel I	28	19	10	17	8	Wright 1972	5:11
15	Knechtel I	27	16	9	16	11	Wright 1972	6:2
16	Innes	42	19	11	14	14	Lennox 1986	10:10
17	Innes	35	18	10	12	11	Lennox 1986	10:8
18	Innes	45	21	12	14	12	Lennox 1986	10:6
19	Innes	38	20	12	16	11	Lennox 1986	10:5
20	Innes	39	21	9	12	12	Lennox 1986	10:2
21	Innes	50	31	12	13	10	Lennox 1986	10:4
22	Innes	32	23	9	11	12	Lennox 1986	10:1
23	Innes	39	23	12	15	12	Lennox 1986	10:3
24	Inverhuron	41	20	10	14	11	W. Kenyon 1959	IV:5
25	Inverhuron	45	21	13	14	12	W. Kenyon 1959	IV:6
26	Inverhuron	47	29	14	19	10	W. Kenyon 1959	IV:8
27	Inverhuron	47	19	10	13	11	W. Kenyon 1959	IV:7
28	Inverhuron	35	25	12	15	10	W. Kenyon 1959	IV:9
29	Inverhuron	54	26	10	18	11	W. Kenyon 1959	IV:10
30	Inverhuron	38	17	13	17	10	W. Kenyon 1959	IV:11
31	Rocky Ridge	42	24	16	23	11	Ramsden n.d.	11:c
32	Rocky Ridge	40	26	12	16	9	Ramsden n.d.	11:d
33	Rocky Ridge	51	25	10	17	15	Ramsden n.d.	11:f
34	Welke-Tonkonoh	43	25	13	14	8	Muller 1988	18:2
35	Welke-Tonkonoh	42	24	14	16	8	Muller 1988	18:106
36	Welke-Tonkonoh	50	28	15	19	8	Muller 1988	18:122
37	Hind	51	25	11	20	9	Spence and Fox 1986	1.5
38	Hind	50	24	13	22	8	Spence and Fox 1986	1.5
39	Hind	79	28	14	22	8	Spence and Fox 1986	1.6
40	Hind	69	38	16	29	9	Spence and Fox 1986	1.6
41	Hind	70	31	11	24	10	Spence and Fox 1986	1.6

Table 1. Measurements of Projectile Point Sample.

Welke-Tonkonoh. Located in the interior of the Caradoc sand plain, the Welke-Tonkonoh site was excavated by Chris Ellis in 1980. The site was multicomponent containing occupations ranging in age from Paleoindian to Woodland. One portion of the site, however, contained a subsoil concentration of artifacts attributed to the Late Archaic, although there is no carbon date for Welke-Tonkonoh. Joseph Muller (1988) has prepared an analysis of this material.

Hind. The Hind Cemetery site is located near a bend in the Thames River near Wardsville. Excavated by Stan Wortner and Bill Donaldson, the Hind site has yielded the remains of 26 individuals, which were accompanied by a rich complement of "Glacial Kame" grave goods (Wortner 1978; Spence and Fox 1986). Radiocarbon dates (Wilmeth 1978) from the site are all from bone. One sample, which had been subdivided and prepared by three different pretreatment techniques, has readings of 2620 ± 120 B.C., 970 ± 170 B.C. and A.D. 160 ± 100. A second sample is dated to 925 ± 75 B.C. It is assumed that the two ca. 900 B.C. dates are applicable to the Glacial Kame burial component.

Methodology

For each point, five basic measurements were taken (Figure 3; Table 1). This represents a rather small subset of the large number of point measurements that have been used in some analyses. For an exploratory study, however, I believed that these simple five dimensions would capture the major size and shape variation of the Late Archaic point sample.

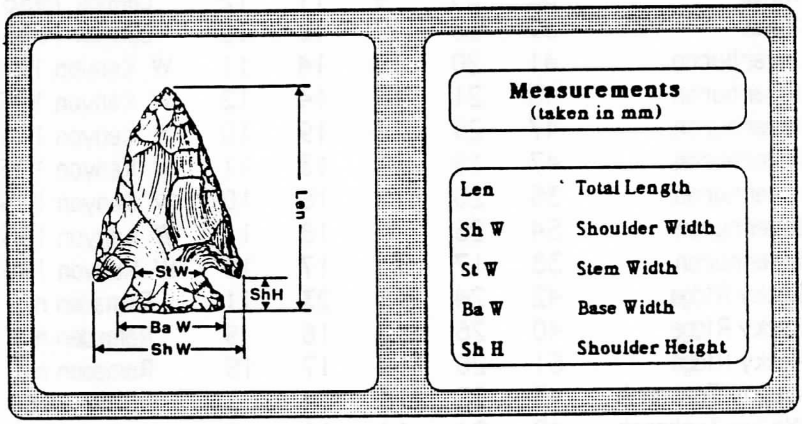


Figure 3. Projectile Point Measurements Used in This Study.

Certain specimens were dropped from the study. Incomplete points were excluded, although if only the tip or a basal tang was missing the incomplete dimension was estimated by eye. While such semi-intuitive estimations might be considered inappropriate, to use only specimens in pristine condition would have reduced the sample by about half. As well, "intrusive" points were eliminated but this was only necessary for Innes, as discussed above. A few points were also excluded because they looked to be extensively reworked. For example, one specimen from the Innes site (Lennox 1986: Figure 10: 9) was likely fashioned from the snapped tip of a broken point. A possibly similar specimen comes from Inverhuron Area R (W. Kenyon 1959: Plate 4: 14). In all, 41 projectile points are examined in the present study.

To reduce observer error all measurements were made by the author. For Crawford Knoll and Innes the actual points were measured. For Rocky Ridge, Welke-Tonkonoh, and Inverhuron the points were measured from the illustrations in the reports cited in Table 1. For Knechtel I (courtesy of the National Museums of Civilization) and Hind, Bill Fox provided photographic negatives from which same-size prints were made, and then measured. Since photographs were used for measurements, it was obviously not possible to use thickness as one of the variables.

Since the present study was intended as exploratory, the data were examined using a variety of quantitative methods, only some of which are reported below. The purpose and spirit of such exploratory data analysis is well described by Everitt and Dunn:

> ...methods are sought which allow possibly unanticipated patterns in the data to be detected, opening up a wide range of alternative explanations. Such techniques are generally characterized by their emphasis on the importance of visual displays and graphical representations, and by the lack of any associated stochastic model, so that questions of the statistical significance of results hardly ever arise. (Everitt and Dunn 1986: 4).

Intrasite Variations

A glance at the point outline drawings (Figure 2) shows that within some sites there is considerable variation in point shape and size, a phenomenon that probably results from a number of factors. These include differences among individual knappers or even band "micro-traditions", the presence of exchange items, time depth within sites, raw material effects and reworking. As well, it may have been that as long as the points fell within a broadly defined size and shape range, the hunters who made and used these points may not have required them to be highly standardized.

There are some data from the seven sites suggestive of the range of factors underlying intrasite variation.

Raw Material Effects

The inhabitants of the Crawford Knoll site did not have access to any locally available cherts, and the lithic raw material used for projectile points at this site derive from a variety of sources, seemingly from all directions. The most widely used material is Kettle Point chert from the southeast Lake Huron shore, followed by Bayport chert from the Saginaw Bay area, Michigan. From the east is Onondaga chert, and there is a single point made from Stoney Creek chert, which can be found in southeastern Michigan.

Although sample sizes are small, projectile points of different materials tend to be of different sizes (Figure 4). The 5 Kettle Point specimens are all under 31 mm in length, while the three Bayport ones range from 37 to 38 mm. The single specimen of Stoney Creek chert, with a length of 51 mm, is much larger than anything else from the site.

Size differences among raw material types is evident on the earlier Broadpoint sites (Kenyon 1980b; Fisher 1987), where this is explained as owing to the inherently different mechanical properties of various lithics. It is less clear whether such an explanation can be used for raw material metric variation at Crawford Knoll. At least some of the Kettle Point and Bayport points were finished on site, since preforms of both materials are in the assemblage. Although points of these two sources may differ in size because of the physical properties of the cherts, it is also possible that different micro-traditions may be reflected in the point assemblage (see next section).

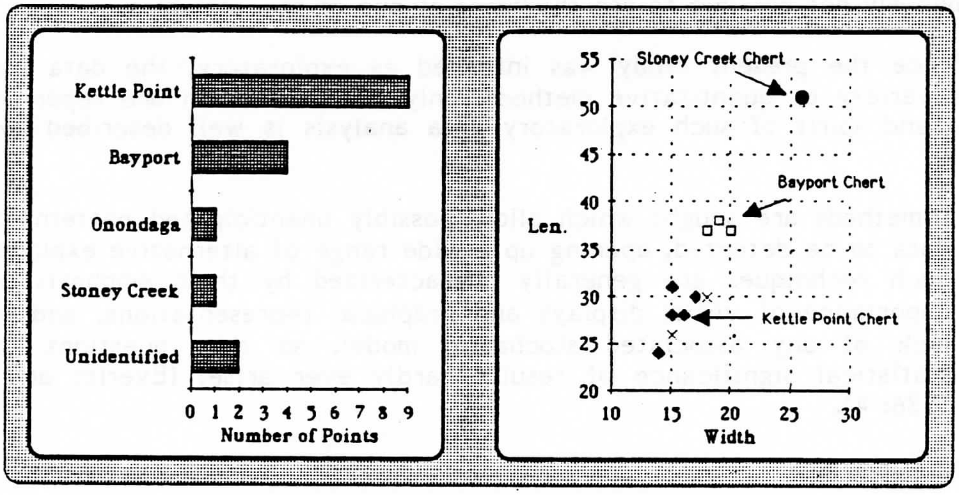


Figure 4. Crawford Knoll Site: lithic raw materials (left); length and shoulder width (right) of projectile points.

Spatial Variation

At the Innes site Lennox (1986) identified two large clusters of artifacts, which he associates with two activity areas, possibly houses. The northern artifact cluster can be taken to be the squares north of the 0 grid line. When point width is plotted against the grid north-south line, a slight difference emerges between the northern and southern artifact clusters (Figure 5). The points in the northern area tend to be narrower (under 20 mm) while those from the southern artifact cluster are slightly wider (over 20 mm). This can not be due simply to lateral resharpening since a similar trend can also be observed in preform width (Figure 5). As well, raw material effects can be excluded because the projectile point assemblage is almost entirely of Onondaga chert.

As with raw material variation at Crawford Knoll, there are a number of possible interpretations of the spatial size differences at Innes. The northern artifact cluster contains a feature yielding a 1400 ± 195 B.C. radiocarbon date, while the southern area has a feature with a 670 ± 80 B.C. date. Taken at face value this suggests that the two areas may simply be two temporally discrete components separated in time by about 700 years. Lennox, however, prefers to see the two areas as contemporaneous and suggests the 1400 B.C. date is applicable to both. And, in fact, aside from the difference in widths, the points from both areas are very much alike, as are the other tools. One possibility is that the knappers in each area, even if contemporaneous, may reflect different micro-traditions; that is, there may have been minor stylistic differences among individual families, local or regional bands. Perhaps significant here is that the southern artifact cluster displays much more in the way of "exotic" cherts from the west, including Kettle Point and Upper Mercer (Ohio). This implies that the occupants of the southern cluster maintained closer contacts with groups to the west, and, possibly through the exchange of ideas or even people, possessed a point making micro-tradition that slightly differed from the northern activity area. It is also possible that the two site areas simply reflect different types of activities which necessitated hafted bifaces with different attributes (e.g. projectile points vs. knives).

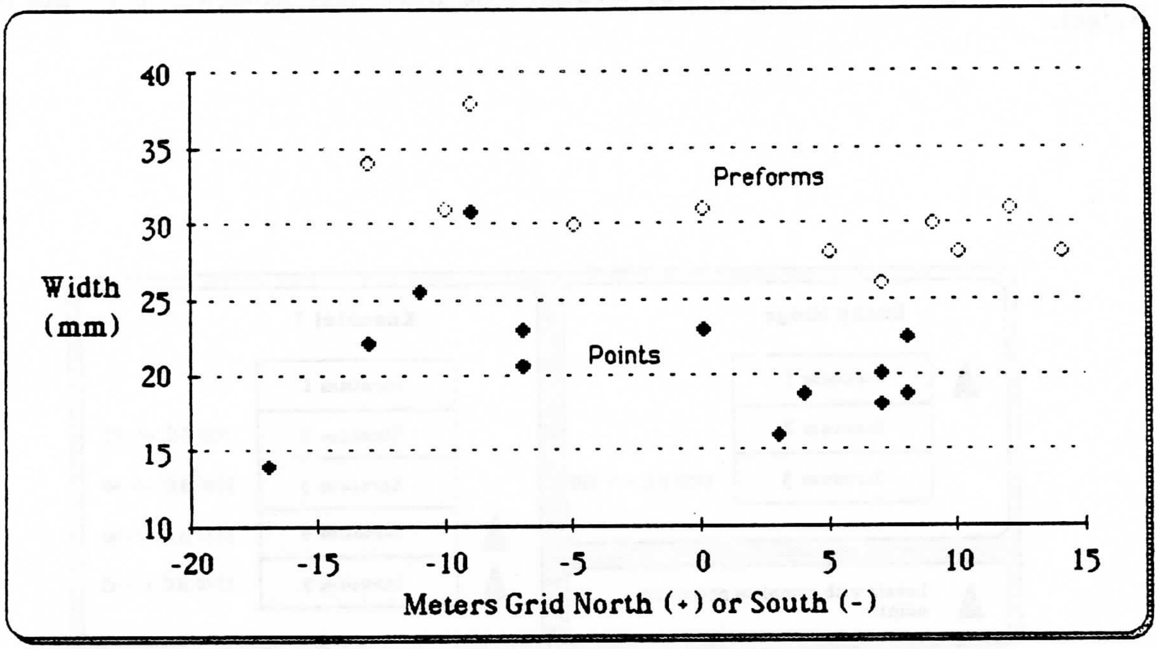


Figure 5. Innes Site: widths of projectile points and preforms plotted against grid north (to right) and south (to left).

Length of Site Occupation

Another factor to be considered is the length of occupation at each site. At ploughed sites like Crawford Knoll and Innes the assemblages look to be relatively "pure", yet even if they are "single" components we have no idea whether they were (seasonally) occupied over the length of months, years, decades or even centuries. A resource-rich locale like Crawford Knoll, so long as it was not flooded during high water periods, may have attracted Archaic bands for centuries. If so, then during the period of (intermittent) occupation, there may well have been "style drift" within the projectile point manufacturing technology.

For the two stratified sites of the "Inverhuron" Archaic, Knechtel I and Rocky Ridge, it is reasonably certain both were inhabited over a number of centuries, and that there was considerable overlap in their dates of occupation (Figure 6). What is intriguing, however, is the samples of measurable projectile points from these two sites are from the opposite ends of the sequence. At Rocky Ridge all projectile points come from the uppermost level. While this level is undated (it should post-date 1150 ± 120 B.C.), Ramsden estimates its age as ca. 900 - 600 B.C. (Ramsden n.d.: 44). By contrast, at Knechtel I the measurable points come from the two lowest levels, radiocarbon dated to 1300 ± 90 and 1740 ± 45 B.C. That is, although the two sites are in part contemporaneous the projectile point samples are not. When shoulder width is examined there is a significant difference between Rocky Ridge and Knechtel I (Figure 6): the Rocky Ridge points average about 6 mm wider than the ones from Knechtel I, with virtually no overlap in their ranges. Once again, explaining this difference is open to a number of interpretations. The most obvious one is that projectile points in the Inverhuron sequence increase in size through time from early (Knechtel I) to late (Rocky Ridge).

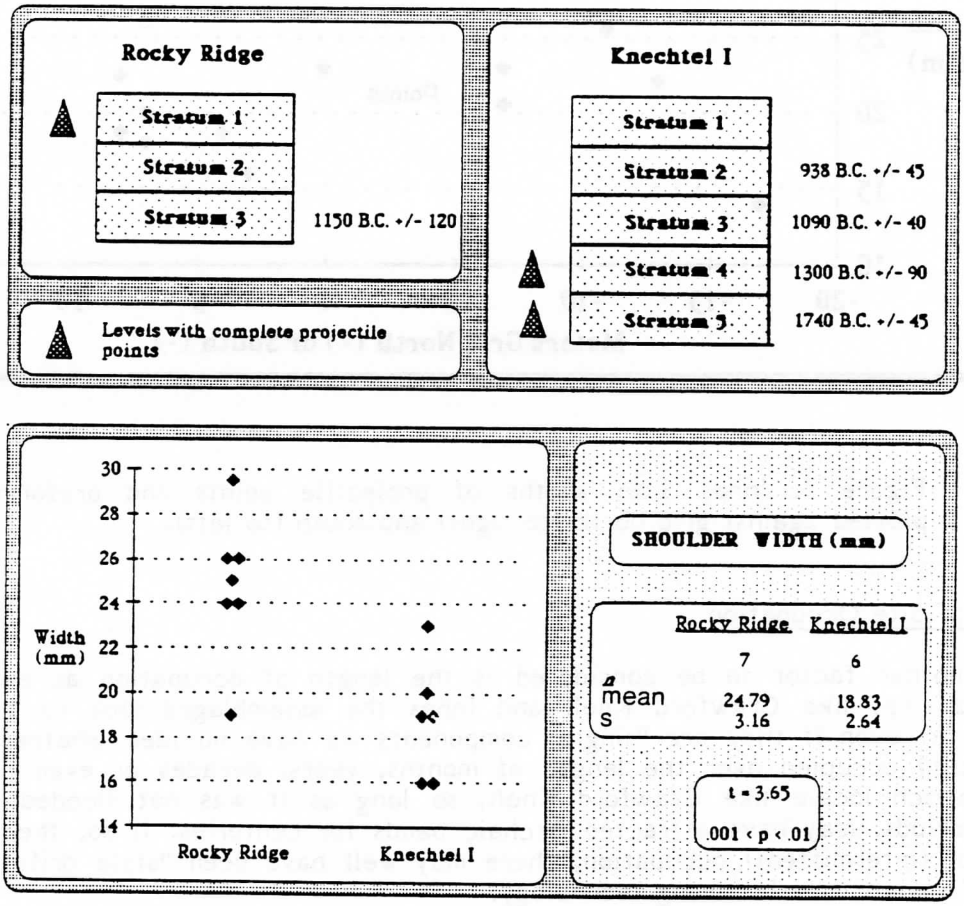
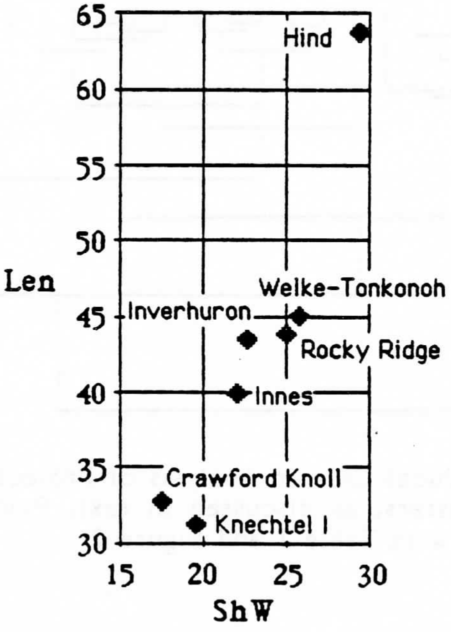


Figure 6. Rocky Ridge and Knechtel I Sites: synopsis of stratigraphy and radiocarbon dates (above); projectile point shoulder widths (below).

Table 2. Summary Statistics by Site.

Site	**N**		**Len**	**ShW**	**StW**	**BaW**	**ShH**
Hind	5	Mean	63.80	29.20	13.00	23.40	8.80
		Std Dev	12.76	5.63	2.12	3.44	0.84
Welke-Tonkonoh	3	Mean	45.00	25.67	14.00	16.33	8.00
		Std Dev	4.36	2.08	1.00	2.52	0.00
Rocky Ridge	3	Mean	72.67	32.33	13.67	25.00	9.00
		Std Dev	5.51	5.13	2.52	3.61	1.00
Inverhuron	7	Mean	43.86	22.43	11.71	15.71	10.71
		Std Dev	6.39	4.31	1.70	2.29	0.76
Innes	8	Mean	40.00	22.00	10.88	13.38	11.75
		Std Dev	5.66	4.04	1.36	1.69	1.16
Knechtel I	4	Mean	31.25	19.50	10.50	16.25	9.00
		Std Dev	4.35	2.65	1.29	0.50	1.41
Crawford Knoll	11	Mean	32.73	17.55	9.73	12.18	7.91
		Std Dev	7.63	3.39	1.74	2.99	1.92

Figure 7. Scattergram of Mean Lengths and Shoulder Widths.



Intersite Variation

A plot of the mean lengths and widths of points from the seven sites shows considerable differences among the sites (Figure 7; Table 2). Three size groupings seem evident. The smallest points, averaging 30-35 mm in length, are found at Crawford Knoll and Knechtel I. Larger points, averaging 40-45 mm in length, occur at Innes, Inverhuron, Rocky Ridge and Welke-Tonkonoh. Lastly, the Hind points, about 65 mm in length, are conspicuously large, about twice the size of Crawford Knoll points.

To further explore some of this size and shape variation among the sites, the data set (Table 1) was subjected to certain multivariate analytic techniques; namely, cluster analysis and principal component analysis. The variates used in this analysis were transformed in an attempt to minimize inbuilt redundancies, since it follows that there will be a high correlation between, say, total length and stem length, because the latter dimension is part of the former one. The transformed variates are: blade length (= total length minus shoulder height); shoulder expansion (= shoulder width minus stem width); stem width; base expansion (= base width minus stem width); and stem length (shoulder height).

A hierarchical cluster analysis (Everitt 1974; Gordon 1981) was performed as follows. Measurements were standardized so they had a mean of 0 and a standard deviation of 1. The euclidean distance between all points was calculated and then the resulting distance matrix was clustered using Ward's method (Figure 8).

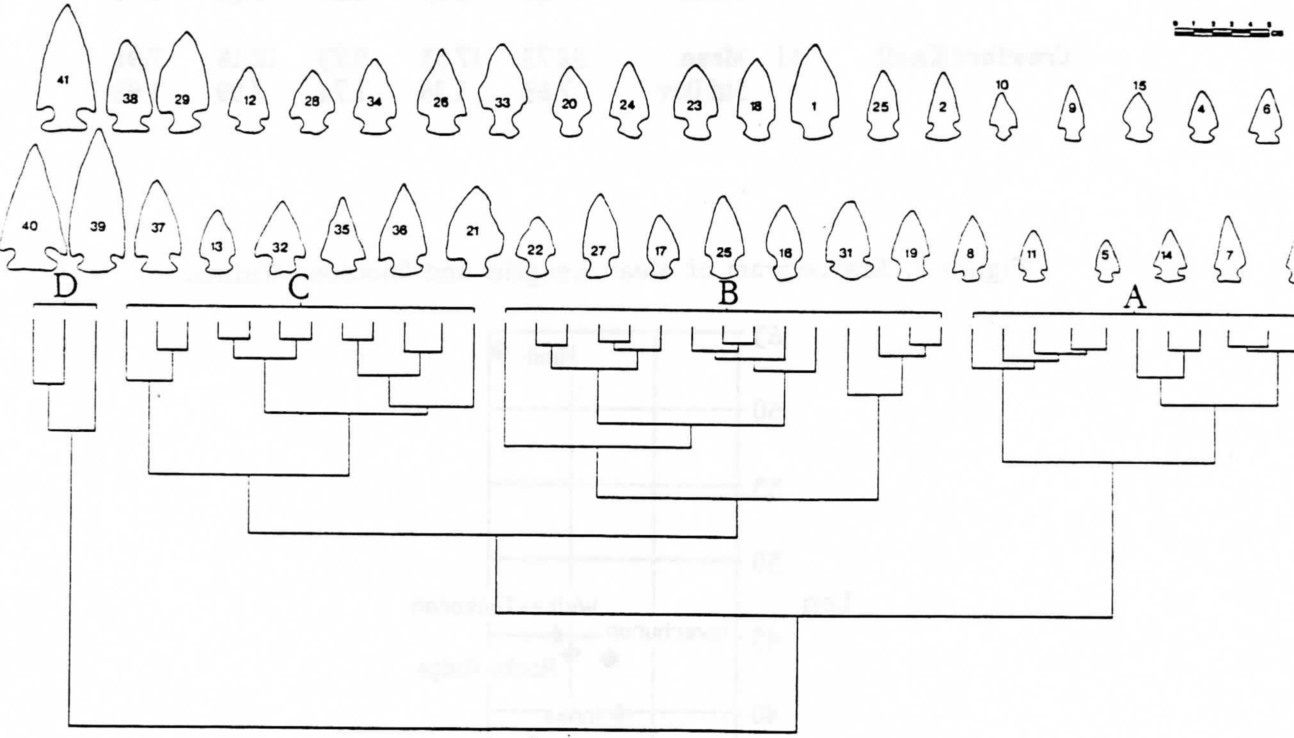


Figure 8. Hierarchical Cluster Analysis of Projectile Points. Letters denote the 4 clusters, as discussed in text. Point numbers can be cross-referenced with Table 1 and Figure 2.

As with other such hierarchical cluster analyses, the number of clusters to be derived from the resulting dendrogram (Figure 8) depends not only on its structure but also the investigator's needs. For present purposes 4 higher level clusters are recognized, labelled on the dendrogram A through D. These clusters can roughly be described as follows: (A) small sized notched points; (B) stemmed points; (C) medium sized notched points; (D) large sized notched points. Within clusters A, B and C, subclusters often representing size variants are evident but these will not be further discussed here.

Principal component analysis (Jolliffe 1986) attempts to reduce the original set of intercorrelated variables to fewer significant uncorrelated variables. In this case about 73% of the variation of the original five variables can be accounted for by the first two components of the analysis. The first component is positively weighted on all five variables, so this can be interpreted as reflecting size: points with low scores on this component are relatively small and ones with high scores relatively large. The second component contrasts shoulder height (stem length) against blade length and basal expansion. Points with high scores on this component have long but only slightly flaring stems relative to the blade length. Points with low scores are those with the opposite characteristics (i.e notched points).

PRINCIPAL COMPONENT ANALYSIS

Component Vectors (Loadings)

	1	2	3	4
Blade Length	+.564	-.168	+.052	-.197
Shoulder Expansion	+.510	-.021	-.342	-.608
Stem Width	+.424	+.061	+.836	+.141
Basal Expansion	+.465	-.169	-.408	+.752
Shoulder Height	+.163	+.969	-.122	+.075
Eigenvalues	2.61	.97	.71	.50
%	52.2	19.5	14.2	10.1

On the scattergram showing the scores of the first two components (Figure 9), lines or convex hulls (Jolliffe 1986: 67-69) have been placed around the points grouped in the cluster analysis. From the scattergram it can be seen that cluster B scores high in the second component (long stems) with the other clusters are relatively low in this component (notched). The A, B and D clusters, however, are separated by the first (size) component, as was previously observed by inspection of the point outline drawings on the dendrogram. Also, by examining the scattergram of component scores, it becomes evident that, for the most part, the clusters (aside from D) do not form distinct, well-separated groups. That is, the cluster analysis has not so much found discrete "types", but rather has "dissected" a more-or-less continuous multivariate reality into a number of chunks. Sometimes the cluster analysis has torn apart specimens that would seem to belong together. For example the four points from Knechtel I are relatively similar to one another, but two have been assigned to cluster A and two to cluster C.

What is reassuring, however, despite the dirtiness of the data, is that points from the same sites tend to occur in only one or two clusters:

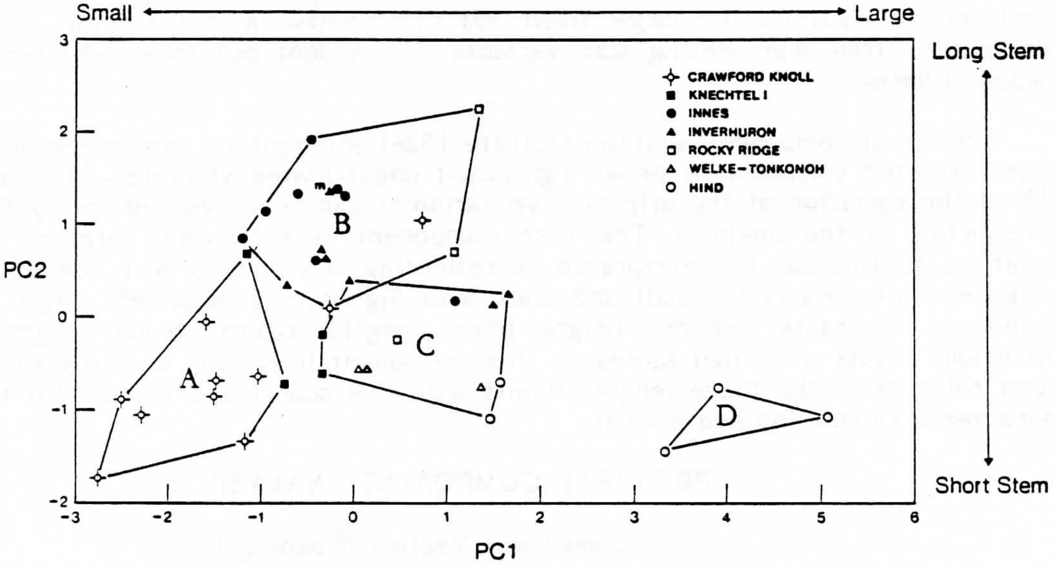


Figure 9. Graph showing projectile points plotted against the first two principal components. Encircling lines (convex hulls) show the range or scatter of points belonging to the four clusters. "m" denotes the single point from Inverhuron Area M.

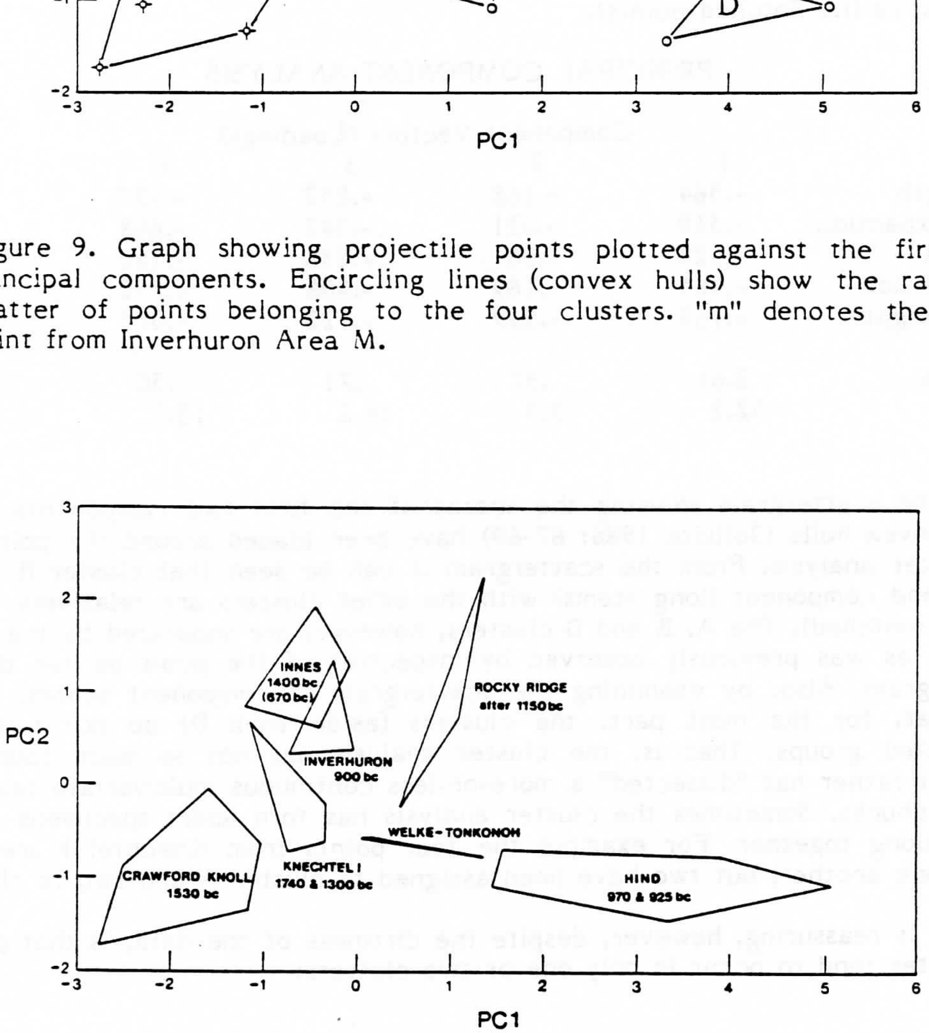


Figure 10. Simplified principal component plot showing range or scatter by site (see text), and "accepted" radiocarbon dates.

	CLUSTER A	B	C	D
Crawford Knoll	9	2	-	-
Knechtel I	2	-	2	-
Innes´	-	7	1	-
Inverhuron	-	4	3	-
Rocky Ridge	-	2	1	-
Welke-Tonkonoh	-	-	3	-
Hind	-	-	2	3
TOTAL	11	15	12	3

Crawford Knoll appears to be relatively discrete with 9 of its 11specimens falling into the small point cluster (A). Innes is dominated by stemmed points (B) with similar points being found at Inverhuron and Rocky Ridge. Medium notched points (cluster C) also seem to be significant at Inverhuron. Only medium notched points are found at Welke-Tonkonoh. The Hind site has both medium and large size notched points. The three largest points (cluster D) are notably well-made specimens and it is reasonable to speculate that these may be specialized mortuary items. The two smaller points (cluster C) from Hind are less carefully knapped, and these may be more representative of utilitarian points. These two smaller points from Hind compare well with those from the Welke-Tonkonoh habitation site, and even two specimens from Inverhuron.

In general, these clusters correspond reasonably well with some of the named point types from southwestern Ontario: cluster A with "Crawford Knoll", cluster B with "Innes" and clusters C and D with "Hind".

Figure 10 uses the same principal component score plot as Figure 9, but in this case to show the spread of points from each of the seven sites, which are outlined with convex hulls. The data, however, have been "cleaned up" by ignoring a few outlying specimens; specifically, 2 large points from Crawford Knoll, 2 from Inverhuron and one from Innes. In general, the sites are relatively well separated and evenly spread across multivariate space. This suggests that what we have in the Terminal Archaic is not so much a few discrete point types but rather a plethora of minor varieties, grading into one another, some of which may even be site or band specific. What was not anticipated is that W. Kenyon's Inverhuron collection does not so much resemble the other Bruce County Archaic components sites as it does Innes, which lies about 150 km to the southeast.

Mapped on to Figure 10 are the "accepted" radiocarbon dates for the sites. It would be imprudent from these data to devise a tight chronological sequence or seriation of Terminal Archaic point types or varieties. As has been observed before (e.g. Spence and Fox 1986) there seems to be a general increase in point size through time. Sites with the earliest radiocarbon dates (Crawford Knoll and Knechtel I) have the smallest points, while the relatively late Hind site has the largest. The radiocarbon dates for the stemmed points of Innes and Inverhuron are equivocal and can be used to argue for a chronological placement anytime within the Terminal Archaic. The fact that these two sites are so similar, despite their spatial distance, suggests that the stemmed points ("Innes points") may represent a horizon marker.

External Comparisons: New York

Owing to the pioneering work of W. Ritchie (e.g. 1969), the Archaic sequence of New York State has long stood as a model for neighbouring regions whose archaeology is less well understood. In particular, Ritchie's (1971) typology has often been used for identifying Archaic points from Ontario.

Few close comparisons, however, can be made between the Terminal Archaic of southwestern Ontario and the New York sequence. Moreover, it does not seem likely that the New York point typology can be extrapolated "as is" to Ontario. Some of the notched Ontario forms resemble the various Brewerton types (ca. 3000 - 2500 B.C.) of the Laurentian Archaic, however, there is a 1000 year time gap for which no cultural continuity has been demonstrated. Some of the narrower stemmed points from Innes and Inverhuron bear a passing resemblance to types of the "Narrow Point" Archaic (e.g. Lamoka, Normanskill) but once again there is no clear evidence for a cultural connection.

External Comparisons: Michigan, Ohio and the American Mid-West

By contrast with New York, so many comparisons can be drawn with the Archaic of Michigan (Lovis and Robertson 1985), and more generally the American Mid-West, that only a brief outline will be given here. Small notched, medium to large notched, and stemmed points are all found in the Late Archaic complexes of the south-central Great Lakes and the American Mid-West.

Small Notched (Crawford Knoll Points)

Small notched points of a size similar to those of Knechtel I and Crawford Knoll have been recovered at the Weber I site, which has radiocarbon dates of 960 ± 70, 1040 ± 110 and 1040 ± 110 B.C. (Lovis 1983). These dates are somewhat later than the Ontario sites. Comparisons can also be made between the small points of Crawford Knoll and those of the Riverton Culture of the Wabash valley in eastern Illinois (Winters 1969). Nine radiocarbon dates for three sites of the Riverton Archaic range between 1540 and 1160 B.C., which fits well with the few Ontario dates.

Medium to Large Notched (Hind Points)

Corner notched points of medium to large size resembling those from Hind, Welke-Tonkonoh and other Ontario sites are found in the Late Archaic of Michigan and Ohio. For example, at the Williams cemetery site in northwestern Ohio (Stothers and Abel n.d.), medium to large corner notched points are included among the grave lots. Williams has a long series of carbon dates ranging between about 1100 and 400 B.C. Hind-like points are dated at the Hoffaker site in Ohio to 780 ± 75 B.C. (Seeman 1986). Similar dates have been obtained from Michigan. In southwestern Michigan corner notched points have been found at the Eidson and Wymer sites (Garland 1986), where they are associated with radiocarbon dates ranging from 990 to 470 B.C. It also seems from these sites that to some degree the corner notched points were contemporary with side notched forms similar to the Early Woodland Meadowood type of Ontario and New York.

Stemmed (Innes Points)

Stemmed points similar to those of the Innes and Inverhuron sites are sometimes termed Durst or Ace-of-Spades in the American literature. Durst points were first defined for Wisconsin, where plausible radiocarbon dates are 1090 ± 250, 760 ± 65 and 620 ± 70 B.C. (Stoltman 1986: 227). A similar chronological placement is indicated by the Michigan data (Lovis and Robertson 1985; Garland 1986), where radiocarbon dates for stemmed points mostly range between ca. 1100 B.C. to as late as ca. 300 B.C.

Summary and Conclusions

This paper has attempted to analyze some of the variation that exists both within and between projectile point assemblages of seven Terminal Archaic sites in southwestern Ontario. While this range of variation can be divided into point clusters that can be labelled as "types" (e.g Innes, Crawford Knoll, Hind), these types are not always truly discrete and they can perhaps best be considered as deriving from an informed but nonetheless arbitrary dissection of an underlying multivariate continuum.

The Terminal Archaic points from Ontario are much more similar to complexes in Michigan, Ohio and the American Mid-West than to anything so far reported for New York. The radiocarbon evidence suggest that the small notched points date to sometime within the 1600 to 1000 B.C. period, and the larger notched forms from 1000 B.C. to 700 B.C., with some possibility that the latter may even extend into Early Woodland times. The chronological placement of the Innes/Durst points is less clear, the bulk of the evidence from the United States indicating they date to sometime after ca. 1100 B.C.

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